

### Updated Draft FCRPS Biological Opinion Tables

On September 5, an updated risk assessment was released by the NMFS Cumulative Risk Initiative (CRI) group. That analysis can be downloaded at the CRI web site:

<http://www.nwfsc.noaa.gov/cri/index.html> . Click on: “AppB (rev 9/5/00)”. A description of the changes that were applied in the new analysis is currently being prepared by CRI.

The new CRI risk assessment significantly affects the draft biological opinion’s assessment of life-cycle effects resulting from the proposed action and the reasonable and prudent alternative for stocks with significant proportions of hatchery-origin spawners. The needed survival changes, especially under “worst case” assumptions, are much lower than previously estimated for these stocks. Changes are less significant for stocks with little or no hatchery-origin spawners, but the results are generally more optimistic for these stocks as well.

Updated draft biological opinion tables that incorporate the new CRI results, as well as correct some previously discovered errors<sup>1</sup>, are attached. Spreadsheets used to generate these tables can be downloaded from the NMFS Northwest Region web site:

<http://www.nwr.noaa.gov/1salmon/salmesa/fedrec.html>. Click on “Updated Excel 97 Spreadsheets (9/7/00)” under “Draft 2000 FCRPS Biological Opinion”.

The new CRI analysis reduces NMFS’ concerns regarding inclusion of the upper bound of estimates in defining the offsite mitigation standard (Section 9.2.2.2.2, page 9-13).

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<sup>1</sup> Snake River steelhead mean generation time changed from 4 years to 5.04 for A-run and 6.09 for B-run, per estimates in the CRI spreadsheet gentime.xls (August 3, 2000). A few of the “best case” estimates in the July 27 draft biological opinion tables were incorrectly transposed from spreadsheets. Corrections are indicated in the updated tables to distinguish them from changes resulting from the new CRI analysis.

**Table 6.3-3.** Snake River Spring/Summer Chinook: Estimated Range of Additional Per-generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing the proposed action

<b>Population</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery, 48 years</b>	<b>50% Recovery, 100 years</b>	<b>Natural River</b>
<i>Marsh Creek</i>					
Best Case	0.84	0.84 <sup>1</sup>	1.08	0.91	1.57
Worst Case	0.96	0.84	1.20	1.02	5.75
<i>Sulphur Creek</i>					
Best Case	0.92	0.84	0.90	0.77	1.57
Worst Case	1.14	0.84	0.95	0.81	5.75
<i>Bear Valley Creek</i>					
Best Case	0.84	0.84	0.90	0.80	1.57
Worst Case	0.84	0.84	0.96	0.86	5.75
<i>Johnson Creek</i>					
Best Case	0.84	0.84	0.80	0.75	1.57
Worst Case	0.84	0.84	0.91	0.85	5.75
<i>Poverty Flats</i>					
Best Case	0.84	0.84	0.85	0.80	1.57
Worst Case	0.84	0.84	0.99	0.92	5.75
<i>Imnaha River</i>					
Best Case	0.96	0.84	1.27	1.15	1.57
Worst Case	1.27	0.84	1.83	1.65	5.75
<i>Minam River</i>					
Best Case	0.88	0.84	1.02	0.90	1.57
Worst Case	1.26	0.84	1.45	1.28	5.75

Note: These improvements are needed to satisfy five jeopardy standard indicator metrics, given implementation of the proposed action. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst cases.

<sup>1</sup> Reported incorrectly in draft biological opinion (that is, the value was not changed by the most recent CRI analysis).

**Table 6.3-5.** Wenatchee River Spring Chinook: Estimated Range of Additional Per-generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing the proposed action.

<b>Population</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>Wenatchee</i>					
<b>Best Case</b>	<b>1.35<sup>1</sup></b>	<b>0.96<sup>1</sup></b>	<b>2.07<sup>1</sup></b>	<b>1.95<sup>1</sup></b>	<b>1.63</b>
<b>Worst Case</b>	<b>2.25</b>	<b>1.06</b>	<b>3.60</b>	<b>3.05</b>	<b>5.94</b>

Note: These improvements would satisfy five jeopardy standard indicator metrics, given implementation of the proposed action. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst cases.

<sup>1</sup> Reported incorrectly in draft biological opinion (that is, the value was not changed by the most recent CRI analysis).

**Table 6.3-7.** Snake River Fall Chinook: Estimated Range of Additional Per-generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing the proposed action.

<b>Population</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>Snake River Falls</i>					
<b>Best Case</b>	<b>0.79</b>	<b>0.64</b>	<b>1.11</b>	<b>1.00</b>	<b>4.78</b>
<b>Worst Case</b>	<b>0.90</b>	<b>0.64</b>	<b>1.37</b>	<b>1.24</b>	<b>5.55</b>

Note: These improvements would satisfy five jeopardy standard indicator metrics, given implementation of the proposed action. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 6.3-9.** Snake River Steelhead: Estimated Range of Additional Per-generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing the proposed action.

<b>Snake River Steelhead</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>A-Run</i>					
Best Case	1.06	0.81	N/A	N/A	1.53
Worst Case	2.03	0.81	N/A	N/A	5.58
<i>B-Run</i>					
Best Case	1.53	0.78	N/A	N/A	1.53
Worst Case	3.06	0.78	N/A	N/A	5.58

Note: These improvements would satisfy five jeopardy standard indicator metrics, given implementation of the proposed action. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 6.3-11.** Methow River Steelhead: Estimated Range of Additional Per-generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing the proposed action.

<b>Population</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>Methow Steelhead</i>					
Best Case	1.00 <sup>1</sup>	0.87	1.35	1.35	1.63
Worst Case	2.88	1.13	4.47	3.96	5.94

Notes: These additional improvements would satisfy five jeopardy standard indicator metrics, given implementation of the proposed action. Numbers less than, or equal to, 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See text for details and definition of best and worst case.

<sup>1</sup> Reported incorrectly in draft biological opinion (that is, the value was not changed by the most recent CRI analysis).

**Table 6.3-13.** Summary of Quantitative Estimates of Effects of Proposed Action on Achievement of Jeopardy Standard Indicator Metrics

Species	ESU	Stream	Needed Survival Change		Survival Change Expected from Proposed Action <sup>1</sup>		Additional Needed Survival Improvements		
			Critical Metric	Minimum Estimate	Maximum Estimate	Low Delayed Mortality	High Delayed Mortality	Low Estimate <sup>2</sup>	High Estimate <sup>3</sup>
<i>Chinook Salmon</i>									
		Snake River Spring/Summer ESU							
		Bear Valley Creek	48-recovery	1.09	1.15	1.19	1.19	0.90	0.96
		Imnaha River	48-recovery	1.52	2.19	1.19	1.19	1.27	1.83
		Johnson Creek	48-recovery	0.96	1.08	1.19	1.19	0.80	0.91
		Marsh Creek	48-recovery	1.28	1.44	1.19	1.19	1.08	1.20
		Minam River	48-recovery	1.22	1.72	1.19	1.19	1.02	1.45
		Poverty Flats (S. Fork Salmon R.)	48-recovery	1.02	1.18	1.19	1.19	0.85	0.99
		Sulphur Creek	100-extinction	1.09	1.36	1.19	1.19	0.92	1.14
		Snake River Fall ESU	48-recovery	1.72	2.14	1.56	1.56	1.11	1.37
		Upper Columbia River Spring-run ESU							
		Wenatchee River	48-recovery	2.15 <sup>4</sup>	3.67	1.02	1.04	2.07	3.60
			full mitigation	1.31	4.78	0.81	0.81	1.63	5.94
<i>Steelhead</i>									
		Upper Columbia River ESU							
		Methow River	48-recovery	1.55	5.13	1.15	1.15	1.35	4.47
		Snake River ESU							
		A-Run component	100-extinction	1.31	2.51	1.23 <sup>4</sup>	1.23 <sup>4</sup>	1.06	2.03
		B-Run component	100-extinction	1.97	3.94	1.28 <sup>4</sup>	1.28 <sup>4</sup>	1.53	3.06

Note: Units are multipliers for changes in survival per generation. Numbers in "Needed Change" columns less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 in these columns are the necessary survival multipliers.

<sup>1</sup> Change in per-generation survival, except when referenced to "Full Mitigation." In that case, survival represents juvenile times adult passage survival, including any delayed effects.

<sup>2</sup> Minimum estimate of needed survival change, coupled with high estimate of action effect.

<sup>3</sup> Maximum estimate of needed survival change, coupled with low estimate of action effect.

<sup>4</sup>Reported incorrectly in draft biological opinion (that is, the value was not changed by the most recent CRI analysis).

**Table 9.2-3.** Estimated Percentage of Additional Improvement in Life Cycle Survival Needed to Meet NMFS' Jeopardy Standard After Achieving Aggressive Hydro Survival Levels Identified in Table 9.2-2. Minimum and maximum are based on best- and worst- case assumptions, respectively as described in text.

Species	ESU	Stream	% Improvement Needed	
			Minimum	Maximum
<i>Chinook Salmon</i>				
	SR Spring/Summer ESU			
		Bear Valley	0	0
		Imnaha	17	69
		Johnson	0	0
		Marsh	0	11
		Minam	0	33
		Poverty Flats	0	0
		Sulphur	0	5
	SR Fall ESU		0	0
	UCR Spring ESU		31	196
<i>Steelhead</i>				
	UCR ESU		13	274
	SR ESU			
		A-Run	0	79
		B-Run	35	169

**Table 9.7-7.** Snake River Spring/Summer Chinook: Estimated Range of Additional Per-Generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing RPA hydro measures.

Population	5% extinct 100 years	5% extinct 24 years	50% Recovery 48 years	50% Recovery 100 years	Natural River
<i>Marsh Creek</i>					
Best Case	0.77	0.77	0.99	0.84	1.45
Worst Case	0.88	0.77	1.11	0.94	5.30
<i>Sulphur Creek</i>					
Best Case	0.84	0.77	0.83	0.71	1.45
Worst Case	1.05	0.77	0.87	0.74	5.30
<i>Bear Valley Creek</i>					
Best Case	0.77	0.77	0.83	0.74	1.45
Worst Case	0.77	0.77	0.89	0.79	5.30
<i>Johnson Creek</i>					
Best Case	0.77	0.77	0.74	0.69	1.45
Worst Case	0.77	0.77	0.83	0.78	5.30
<i>Poverty Flats</i>					
Best Case	0.77	0.77	0.78	0.73	1.45
Worst Case	0.77	0.77	0.91	0.85	5.30
<i>Immaha River</i>					
Best Case	0.88	0.77	1.17	1.06	1.45
Worst Case	1.17	0.77	1.69	1.52	5.30
<i>Minam River</i>					
Best Case	0.81	0.77	0.94	0.83	1.45
Worst Case	1.16	0.77	1.33	1.18	5.30

Note: These improvements are needed to satisfy five jeopardy standard indicator metrics, given implementation of the hydrosystem measures in the RPA. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 9.7-9.** Wenatchee River Spring Chinook: Estimated Range of Additional Per-Generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing RPA hydro measures.

<b>Population</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>Wenatchee</i>					
Best Case	1.13	0.80	1.73	1.63	1.31
Worst Case	1.85	0.87	2.96	2.51	4.78

Note: These improvements are needed to satisfy five jeopardy standard indicator metrics, given implementation of the hydrosystem measures of the RPA and implementation of the proposed Mid-Columbia HCP. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 9.7-11.** Snake River Fall Chinook Estimated Range of Additional Per-Generation Survival Improvements Needed to meet NMFS' jeopardy standard after implementing RPA hydro measures

Population	5% extinct 100 years	5% extinct 24 years	50% Recovery 48 years	50% Recovery 100 years	Natural River
<i>Snake River</i>					
Best Case	0.57	0.47	0.80	0.72	3.48
Worst Case	0.65	0.47	1.00	0.90	4.04

Numbers less than, or equal to, 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See text for details and definition of best and worst case.

**Table 9.7-13.** Snake River Steelhead: Estimated Range of Additional Per-Generation Survival Improvements Needed to meet NMFS' jeopardy standard after implementing RPA hydro measures

Snake River Steelhead	5% extinct 100 years	5% extinct 24 years	50% Recovery 48 years	50% Recovery 100 years	Natural River
<i>A-Run</i>					
Best Case	0.93	0.71	N/A	N/A	1.35
Worst Case	1.79	0.71	N/A	N/A	4.91
<i>B-Run</i>					
Best Case	1.35	0.68	N/A	N/A	1.35
Worst Case	2.69	0.68	N/A	N/A	4.91

Note: Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 9.7-15.** Methow River Steelhead: Estimated Range of Additional Per-Generation Survival Improvements needed to meet NMFS' jeopardy standard after implementing RPA hydro measures

Population	5% extinct 100 years	5% extinct 24 years	50% Recovery 48 years	50% Recovery 100 years	Natural River
<i>Methow Steelhead</i>					
Best Case	0.84 <sup>1</sup>	0.73	1.13	1.13	1.36
Worst Case	2.41	0.94	3.74	3.32	4.97

Note: These improvements are needed to satisfy five jeopardy standard indicator metrics, given implementation of the hydrosystem measures of the RPA and implementation of the proposed Mid-Columbia HCP. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

<sup>1</sup> Reported incorrectly in draft biological opinion - unchanged by CRI analysis

**Table 9.7-17.** Summary of Quantitative Estimates of Effects of RPA on Achievement of Jeopardy Standard Indicator Metrics

Species	ESU	Stream	Needed Survival Change		Survival Change Expected from RPA <sup>1</sup>		Additional Needed Survival Improvements		
			Critical Metric	Minimum Estimate	Maximum Estimate	Low Delayed Mortality	High Delayed Mortality	Low Estimate <sup>2</sup>	High Estimate <sup>3</sup>
<i>Chinook Salmon</i>									
		Snake River Spring/Summer ESU							
		Bear Valley Creek	48-recovery	1.09	1.15	1.30	1.30	0.83	0.89
		Imnaha River	48-recovery	1.52	2.19	1.30	1.30	1.17	1.69
		Johnson Creek	48-recovery	0.96	1.08	1.30	1.30	0.74	0.83
		Marsh Creek	48-recovery	1.28	1.44	1.30	1.30	0.99	1.11
		Minam River	48-recovery	1.22	1.72	1.30	1.30	0.94	1.33
		Poverty Flats (S. Fork Salmon R.)	48-recovery	1.02	1.18	1.30	1.30	0.78	0.91
		Sulphur Creek	100-extinction	1.09	1.36	1.30	1.30	0.84	1.05
		Snake River Fall ESU	48-recovery	1.72	2.14	2.14	2.14	0.80	1.00
		Upper Columbia River Spring-run ESU							
		Wenatchee River	48-recovery	2.15	3.67	1.24	1.24	1.73	2.96
			full mitigation	1.31	4.78	1.00	1.00	1.31	4.78
<i>Steelhead</i>									
		Upper Columbia River ESU							
		Methow River	48-recovery	1.55	5.13	1.37	1.37	1.13	3.74
		Snake River ESU							
		A-Run component	100-extinction	1.31	2.51	1.40 <sup>4</sup>	1.40 <sup>4</sup>	0.93	1.79
		B-Run component	100-extinction	1.97	3.94	1.46 <sup>4</sup>	1.46 <sup>4</sup>	1.35	2.69

Note: Units are multipliers for changes in survival per generation. Numbers in "Needed Change" columns less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 in these columns are the necessary survival multipliers.

<sup>1</sup> Change in per-generation survival, except when referenced to "Full Mitigation." In that case, survival represents juvenile times adult passage survival, including any delayed effects.

<sup>2</sup> Minimum estimate of needed survival change, coupled with high estimate of action effect.

<sup>3</sup> Maximum estimate of needed survival change, coupled with low estimate of action effect.

<sup>4</sup> Reported incorrectly in draft biological opinion (that is, the value was not changed by the most recent CRI analysis).

**Table 9.7-21.** Snake River Spring/Summer Chinook Estimated Range of Additional Per-Generation Survival Improvements needed to meet NMFS' jeopardy standard after breaching four Snake River dams.

<b>Population</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>Marsh Creek</i>					
Best Case	0.20	0.20	0.25	0.21	1.35
Worst Case	0.82	0.72	1.03	0.87	1.35
<i>Sulphur Creek</i>					
Best Case	0.1	0.20	0.21	0.18	1.35
Worst Case	0.97	0.72	0.81	0.69	1.35
<i>Bear Valley Creek</i>					
Best Case	0.20	0.20	0.21	0.19	1.35
Worst Case	0.72	0.72	0.82	0.73	1.35
<i>Johnson Creek</i>					
Best Case	0.20	0.20	0.19	0.18	1.35
Worst Case	0.72	0.72	0.77	0.73	1.35
<i>Poverty Flats</i>					
Best Case	0.20	0.20	0.20	0.19	1.35
Worst Case	0.72	0.72	0.84	0.79	1.35
<i>Imnaha River</i>					
Best Case	0.22	0.20	0.30	0.27	1.35
Worst Case	1.08	0.72	1.57	1.41	1.35
<i>Minam River</i>					
Best Case	0.21	0.20	0.24	0.21	1.35
Worst Case	1.08	0.72	1.24	1.09	1.35

Note: These improvements are needed to satisfy five jeopardy standard indicator metrics, given a four-dam Snake River breach. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 9.7-23.** Snake River Fall Chinook: Estimated Range of Additional Per-Generation Survival Improvements needed to meet NMFS' jeopardy standard after breaching four Snake River dams.

<b>Population</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>Snake River</i>					
Best Case	0.18	0.15	0.25	0.23	1.27
Worst Case	0.36	0.26	0.55	0.50	1.57

Note: These improvements are needed to satisfy five jeopardy standard indicator metrics, given breaching of four Snake River dams. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 9.7-25.** Snake River Steelhead: Estimated Range of Additional Per-generation Survival Improvements needed to meet NMFS' jeopardy standard after breaching four Snake River dams.

<b>Snake River Steelhead</b>	<b>5% extinct 100 years</b>	<b>5% extinct 24 years</b>	<b>50% Recovery 48 years</b>	<b>50% Recovery 100 years</b>	<b>Natural River</b>
<i>A-Run</i>					
Best Case	0.21	0.16	N/A	N/A	1.08
Worst Case	1.43	0.57	N/A	N/A	1.08
<i>B-Run</i>					
Best Case	0.30	0.72	N/A	N/A	1.08
Worst Case	2.16	83.83	N/A	N/A	1.08

Notes: These improvements are needed to satisfy five jeopardy standard indicator metrics, if four Snake River dams are breached. Numbers less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 are the necessary survival multipliers. See the text for details and definition of best and worst case.

**Table 9.7-26.** Summary of Quantitative Estimates of Effects of Four-Dam Breach on Achievement of Jeopardy Standard Indicator Metrics

Species	ESU	Stream	Needed Survival Change		Survival Change Expected from Four-Dam Breach <sup>1</sup>		Additional Needed Survival Improvements		
			Critical Metric	Minimum Estimate	Maximum Estimate	Low Delayed Mortality	High Delayed Mortality <sup>4</sup>	Best Case <sup>2</sup>	Worst Case <sup>3</sup>
<i>Chinook Salmon</i>									
		Snake River Spring/Summer ESU							
		Bear Valley Creek	48-recovery	1.09	1.15	1.39	5.09	<b>0.24</b>	<b>0.96</b>
		Imnaha River	48-recovery	1.52	2.19	1.39	5.09	0.53	8.07
		Johnson Creek	48-recovery	0.96	1.08	1.39	5.09	<b>0.20</b>	<b>0.83</b>
		Marsh Creek	48-recovery	1.28	1.44	1.39	5.09	<b>0.29</b>	1.27
		Minam River	48-recovery	1.22	1.72	1.39	5.09	0.49	9.14
		Poverty Flats (S. Fork Salmon R.)	48-recovery	1.02	1.18	1.39	5.09	<b>0.21</b>	1.14
		Sulphur Creek	100-extinction	1.09	1.36	1.39	5.09	<b>0.33</b>	1.32
		Snake River Fall ESU							
			48-recovery	1.72	2.14	3.85	6.78	0.37	1.98
<i>Steelhead</i>									
		Snake River ESU							
		A-Run component	full mitigation	1.31	2.51	1.75 <sup>5</sup>	6.38 <sup>5</sup>	0.21	1.43
		B-Run component	full mitigation	1.97	3.94	1.82 <sup>5</sup>	6.64 <sup>5</sup>	0.30	2.16

Note: Units are multipliers for changes in survival per generation. Numbers in "Needed Change" columns less than or equal to 1.0 indicate that additional survival improvements are not necessary. Numbers greater than 1.0 in these columns are the necessary survival multipliers.

<sup>1</sup> Change in per-generation survival, except when referenced to "Full Mitigation." In that case, survival represents juvenile times adult passage survival, including any delayed effects.

<sup>2</sup> Minimum estimate of needed survival change, coupled with high estimate of action effect.

<sup>3</sup> Maximum estimate of needed survival change, coupled with low estimate of action effect.

<sup>4</sup> High delayed mortality in base case, which is assumed to be eliminated after breaching four dams.

<sup>5</sup> Reported incorrectly in draft biological opinion (that is, the value was not changed by the most recent CRI analysis).